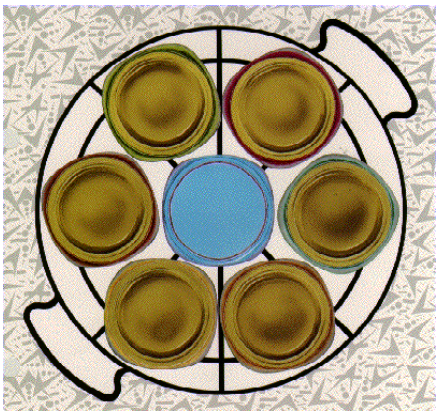

United States Department of Agriculture
Extension Service

Complete Guide to Home Canning

Guide 1, Principles of Home Canning

(**NOTE:** This electronic version of the USDA Complete Guide to Home Canning was created by Utah State University Extension and reviewed by Charlotte Brennand, Extension Food and Nutrition Specialist at Utah State University, July 1995.)

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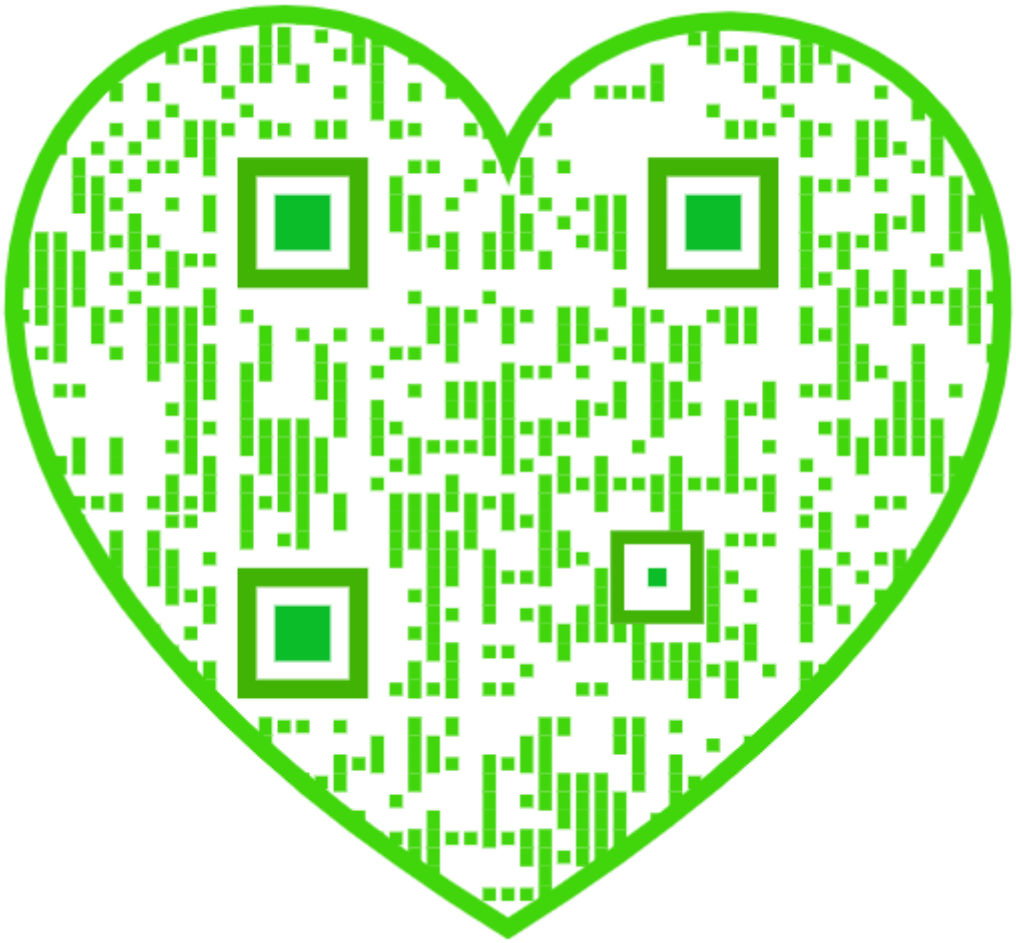


Why Can Foods?

Canning can be a safe and economical way to preserve quality food at home. Disregarding the value of your labor, canning homegrown food may save you half the cost of buying commercially canned food. Canning favorite and special products to be enjoyed by family and friends is a fulfilling experience and a source of pride for many people.

Many vegetables begin losing some of their vitamins when harvested. Nearly half the vitamins may be lost within a few days unless the fresh produce is cooled or preserved. Within 1 to 2 weeks, even refrigerated produce loses half or more of some of its vitamins. The heating process during canning destroys from one-third to one-half of vitamins A and C, thiamin, and riboflavin. Once canned, additional losses of these sensitive vitamins are from 5 to 20 percent each year. The amounts of other vitamins, however, are only slightly lower in canned compared with fresh food. If vegetables are handled properly and canned promptly after harvest, they can be more nutritious than fresh produce sold in local stores.

The advantages of home canning are lost when you start with poor quality fresh foods; when jars fail to seal properly; when food spoils; and when flavors, texture, color, and nutrients deteriorate during prolonged storage.

The information and guides that follow explain many of these problems and recommend ways to minimize them.

How Canning Preserves Foods

The high percentage of water in most fresh foods makes them very perishable. They spoil or lose their quality for several reasons:

- growth of undesirable microorganisms-bacteria, molds, and yeasts,
- activity of food enzymes,
- reactions with oxygen,
- moisture loss.

Microorganisms live and multiply quickly on the surfaces of fresh food and on the inside of bruised, insect-damaged, and diseased food. Oxygen and enzymes are present throughout fresh food tissues.

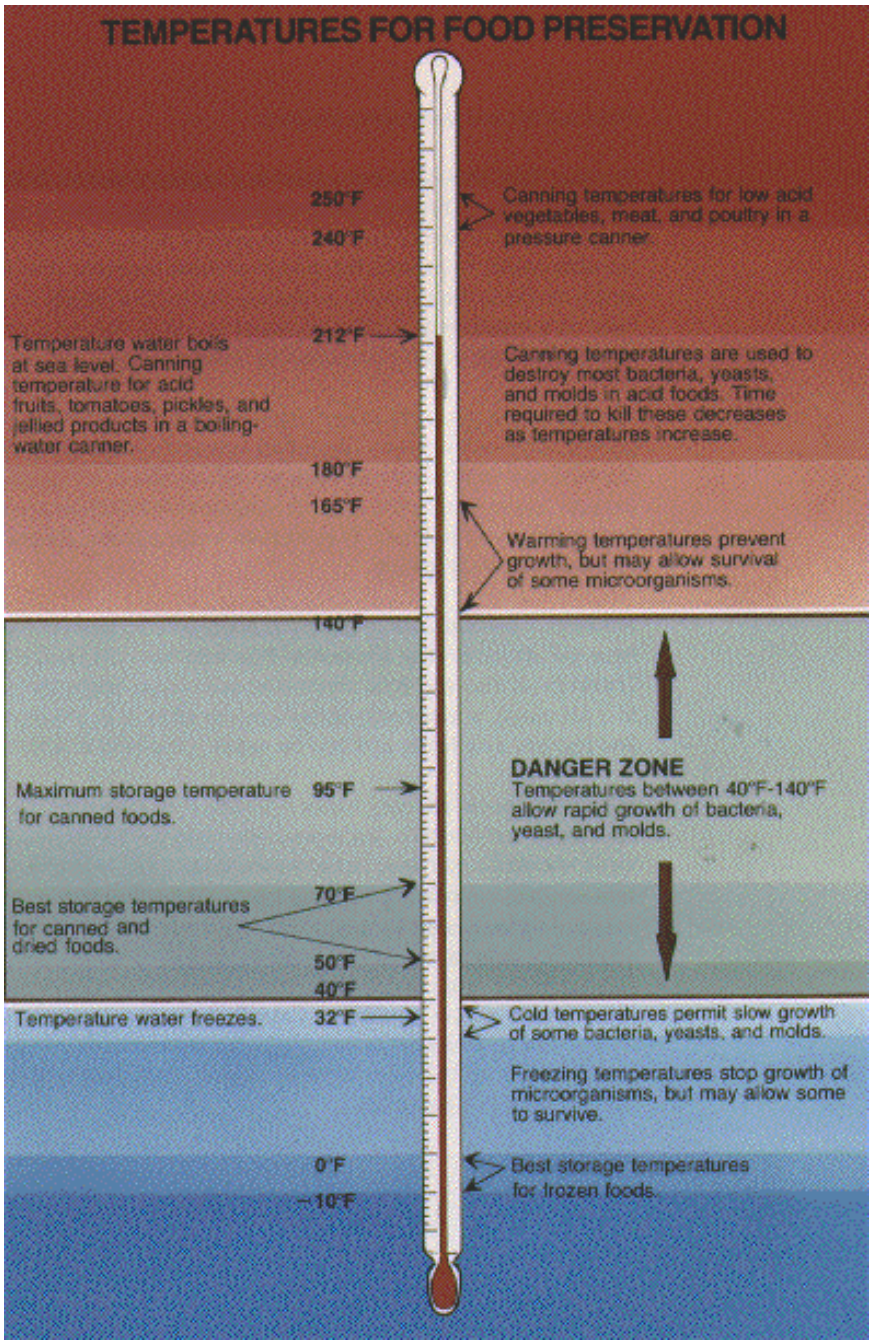
Proper canning practices include:

- carefully selecting and washing fresh food,
- peeling some fresh foods,
- hot packing many foods,
- adding acids (lemon juice or vinegar) to some foods,
- using acceptable jars and self-sealing lids,
- processing jars in a boiling-water or pressure canner for the correct period of time.

Collectively, these practices remove oxygen; destroy enzymes; prevent the growth of undesirable bacteria, yeasts, and molds; and help form a high vacuum in jars. Good vacuums form tight seals which keep liquid in and air and microorganisms out.

Ensuring Safe Canned Foods

Growth of the bacterium *Clostridium botulinum* in canned food may cause botulism—a deadly form of food poisoning. These bacteria exist either as spores or as vegetative cells. The


TEMPERATURES FOR FOOD PRESERVATION
250°F
240°F
Canning temperatures for low acid vegetables, meat, and poultry in a pressure canner.
212°F
Temperature water boils at sea level. Canning temperature for acid fruits, tomatoes, pickles, and jellied products in a boiling-water canner.
Canning temperatures are used to destroy most bacteria, yeasts, and molds in acid foods. Time required to kill these decreases as temperatures increase.
180°F
165°F
Warming temperatures prevent growth, but may allow survival of some microorganisms.
140°F
DANGER ZONE
Temperatures between 40°F-140°F allow rapid growth of bacteria, yeast, and molds.
Maximum storage temperature for canned foods.
95°F
70°F
Best storage temperatures for canned and dried foods.
50°F
40°F
Temperature water freezes.
32°F
Cold temperatures permit slow growth of some bacteria, yeasts, and molds.
Freezing temperatures stop growth of microorganisms, but may allow some to survive.
0°F
-10°F
Best storage temperatures for frozen foods.

spores, which are comparable to plant seeds, can survive harmlessly in soil and water for many years. When ideal conditions exist for growth, the spores produce vegetative cells which multiply rapidly and may produce a deadly toxin within 3 to 4 days of growth in an environment consisting of:

- a moist, low-acid food
- a temperature between 40° and 120° F
- less than 2 percent oxygen

Botulinum spores are on most fresh food surfaces. Because they grow only in the absence of air, they are harmless on fresh foods.

Most bacteria, yeasts, and molds are difficult to remove from food surfaces. Washing fresh food reduces their numbers only slightly. Peeling root crops, underground stem crops, and tomatoes reduces their numbers greatly. Blanching also helps, but the vital controls are the method of canning and making sure the recommended research-based process times, found in these guides, are used.

The processing times in these guides ensure destruction of the largest expected number of heat-resistant microorganisms in home-canned foods. Properly sterilized canned food will be free of spoilage if lids seal and jars are stored below 95° F. Storing jars at 40° to 70° F enhances retention of quality.

Food Acidity and Processing Methods

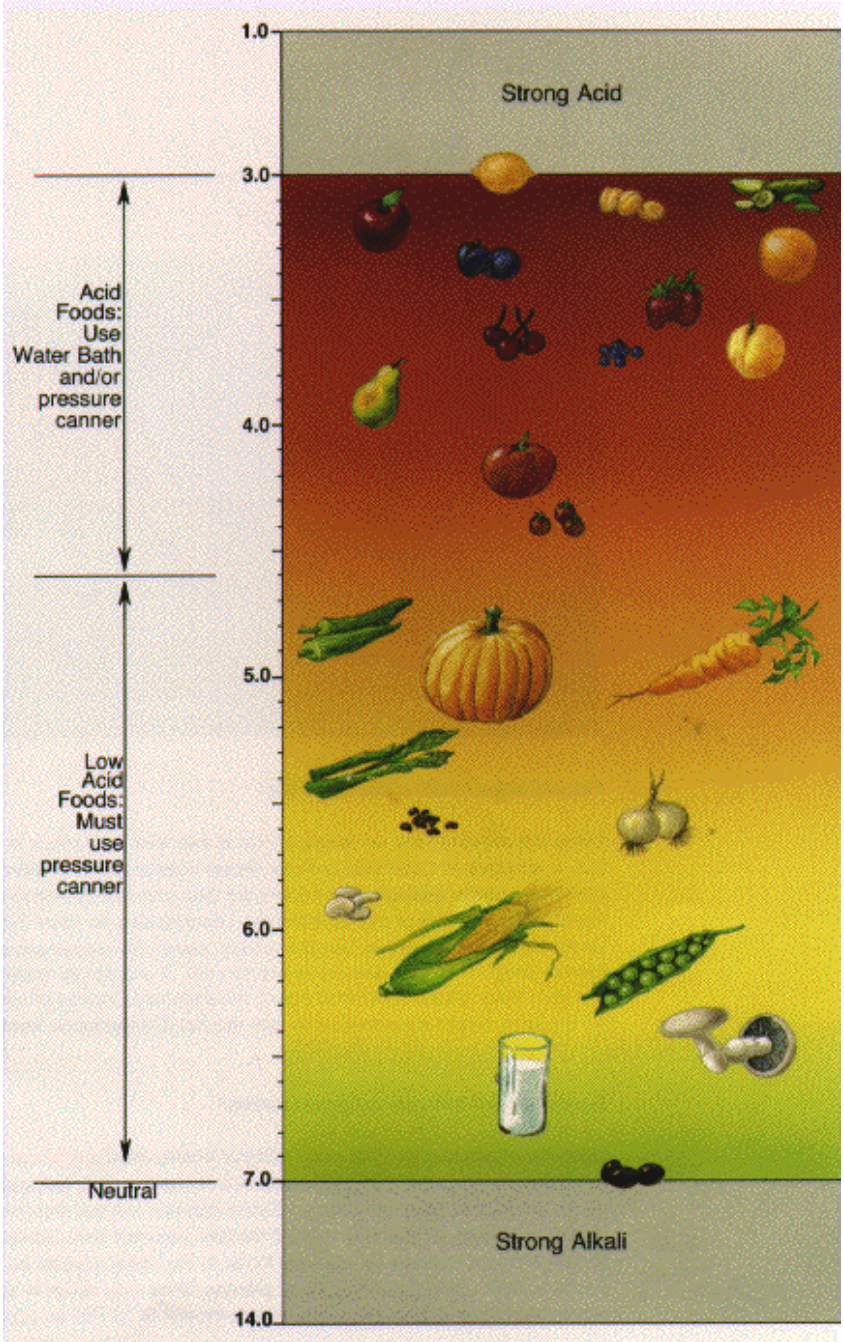
Whether food should be processed in a pressure canner or boiling-water canner to control botulinum bacteria depends on the acidity of the food. Acidity may be natural, as in most fruits, or added, as in pickled food. *Low-acid* canned foods are not acidic enough to prevent the growth of these bacteria. *Acid* foods contain enough acid to block their growth, or destroy them more rapidly when heated. The term "pH" is a measure of acidity; the lower its value, the more acid the food. The acidity level in foods can be increased by adding lemon juice, citric acid, or vinegar.

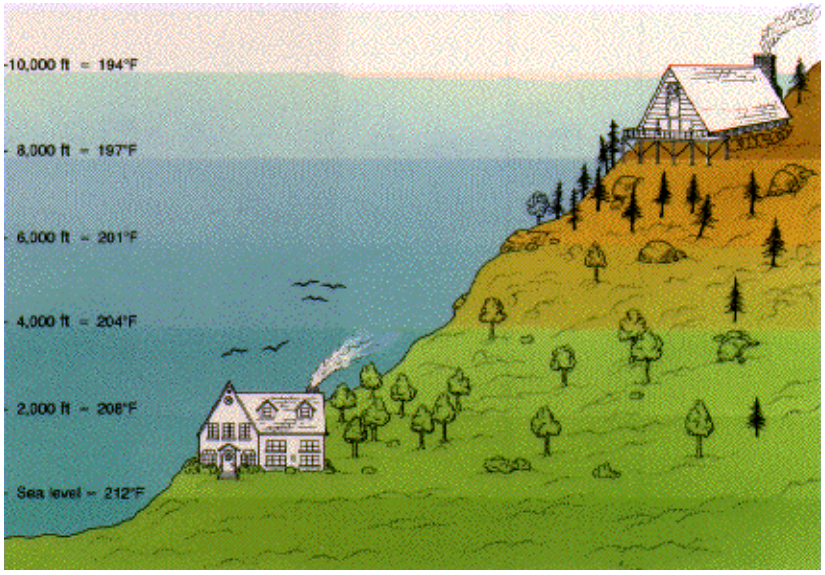
Low-acid foods have pH values higher than 4.6. They include red meats, seafood, poultry, milk, and all fresh vegetables except for most tomatoes. Most mixtures of low-acid and acid foods also have pH values above 4.6 unless their recipes include enough lemon juice, citric acid, or vinegar to make them acid foods. Acid foods have a pH of 4.6 or lower. They include fruits, pickles, sauerkraut, jams, jellies, marmalades, and fruit butters.

Although tomatoes usually are considered an acid food, some are now known to have pH values slightly above 4.6. Figs also have pH values slightly above 4.6. Therefore, if they are to be canned as acid foods, these products must be acidified to a pH of 4.6 or lower with lemon juice or citric acid. Properly acidified tomatoes and figs are acid foods and can be safely processed in a boiling-water canner.

Botulinum spores are very hard to destroy at boiling-water temperatures; the higher the canner temperature, the more easily they are destroyed. Therefore, all low-acid foods should be

sterilized at temperatures of 240° to 250° F, attainable with pressure canners operated at 10 to 15 PSIG. PSIG means pounds per square inch of pressure as measured by gauge. The more familiar "PSI" designation is used hereafter in this publication. At temperatures of 240° to 250° F, the time needed to destroy bacteria in low-acid canned food ranges from 20 to 100 minutes. The exact time depends on the kind of food being canned, the way it is packed into jars, and the size of jars. The time needed to safely process low-acid foods in a boiling-water canner ranges from 7 to 11 hours; the time needed to process acid foods in boiling water varies from 5 to 85 minutes.





Process Adjustments at High Altitudes

Using the process time for canning food at sea level may result in spoilage if you live at altitudes of 1,000 feet or more. Water boils at lower temperatures as altitude increases. Lower boiling temperatures are less effective for killing bacteria. Increasing the process time or canner pressure compensates for lower boiling temperatures. Therefore, when you use the guides, select the proper processing time or canner pressure for the altitude where you live. If you do not know the altitude, contact your local county Extension agent. An alternative source of information would be the local district conservationist with the Soil Conservation Service.

Equipment and Methods Not Recommended

Open-kettle canning and the processing of freshly filled jars in conventional ovens, microwave ovens, and dishwashers are not recommended, because these practices do not prevent all risks of spoilage. Steam canners are not recommended because processing times for use with current models have not been adequately researched. Because steam canners do not heat foods in the same manner as boiling-water canners, their use with boiling-water process times may result in spoilage. It is not recommended that pressure processes in excess of 15 PSI be applied when using new pressure canning equipment. So-called canning powders are useless as preservatives and do not replace the need for proper heat processing. Jars with wire bails and glass caps make attractive antiques or storage containers for dry food ingredients but are not recommended for use in canning. One-piece zinc porcelain-lined caps are also no longer recommended. Both glass and zinc caps use flat rubber rings for sealing jars, but too often fail to seal properly.

Ensuring High-quality Canned Foods

Begin with good-quality fresh foods suitable for canning. Quality varies among varieties of fruits and vegetables. Many county Extension offices can recommend varieties best suited for canning. Examine food carefully for freshness and wholesomeness. Discard diseased and moldy food. Trim small diseased lesions or spots from food.

Can fruits and vegetables picked from your garden or purchased from nearby producers when the products are at their peak of quality-within 6 to 12 hours after harvest for most vegetables. For best quality, apricots, nectarines, peaches, pears, and plums should be ripened 1 or more days between harvest and canning. If you must delay the canning of other fresh produce, keep it in a shady, cool place.

Fresh home-slaughtered red meats and poultry should be chilled and canned without delay. Do not can meat from sickly or diseased animals. Ice fish and seafoods after harvest, eviscerate immediately, and can them within 2 days.

Maintaining Color and Flavor in Canned Food

To maintain good natural color and flavor in stored canned food, you must:

- Remove oxygen from food tissues and jars,
- Quickly destroy the food enzymes,
- Obtain high jar vacuums and airtight jar seals.

Follow these guidelines to ensure that your canned foods retain optimum colors and flavors during processing and storage:

- Use only high-quality foods which are at the proper maturity and are free of diseases and bruises.
- Use the hot-pack method, especially with acid foods to be processed in boiling water.
- Don't unnecessarily expose prepared foods to air. Can them as soon as possible.
- While preparing a canner load of jars, keep peeled, halved, quartered, sliced, or diced apples, apricots, nectarines, peaches, and pears in a solution of 3 grams (3,000 milligrams) ascorbic acid to 1 gallon of cold water. This procedure is also useful in maintaining the natural color of mushrooms and potatoes, and for preventing stem-end discoloration in cherries and grapes. You can get ascorbic acid in several forms:

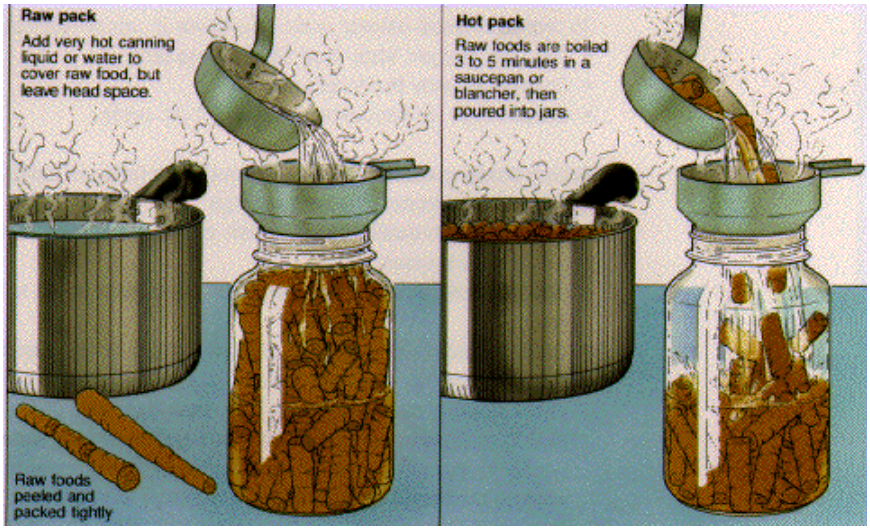
  Pure powdered form—seasonally available among canners' supplies in supermarkets. One level teaspoon of pure powder weighs about 3 grams. Use 1 teaspoon per gallon of water as a treatment solution.

  Vitamin C tablets—economical and available year-round in many stores. Buy 500-milligram tablets; crush and dissolve six tablets per gallon of water as a treatment solution.

  Commercially prepared mixes of ascorbic and citric acid—seasonally available among canners' supplies in supermarkets. Sometimes citric acid powder is sold in supermarkets, but it is less effective in controlling discoloration. If you choose to use

these products, follow the manufacturer's directions.

- Fill hot foods into jars and adjust headspace as specified in recipes.
- Tighten screw bands securely, but if you are especially strong, not as tightly as possible.
- Process and cool jars.
- Store the jars in a relatively cool, dark place, preferably between 50° and 70° F.
- Can no more food than you will use within a year.


Raw pack
Add very hot canning liquid or water to cover raw food, but leave head space.
Raw foods peeled and packed tightly
Hot pack
Raw foods are boiled 3 to 5 minutes in a saucepan or blancher, then poured into jars.

Advantages of Hot-packing

Many fresh foods contain from 10 percent to more than 30 percent air. How long canned food retains high quality depends on how much air is removed from food before jars are sealed.

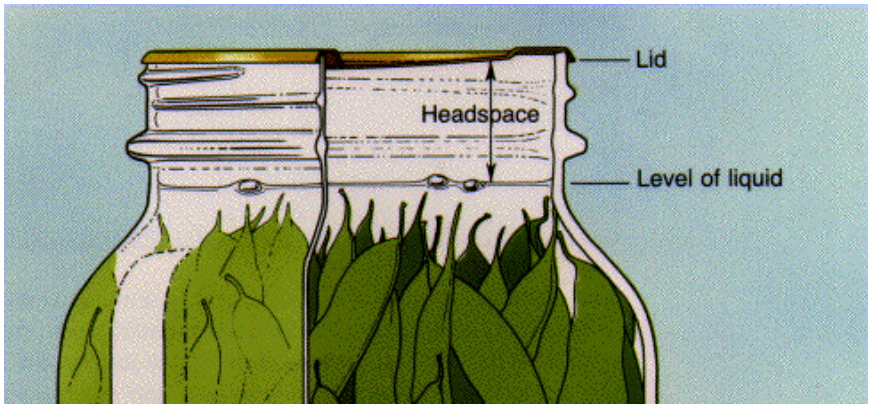
Raw-packing is the practice of filling jars tightly with freshly prepared, but unheated food. Such foods, especially fruit, will float in the jars. The entrapped air in and around the food may cause discoloration within 2 to 3 months of storage. Raw-packing is more suitable for vegetables processed in a pressure canner.

Hot-packing is the practice of heating freshly prepared food to boiling, simmering it 2 to 5 minutes, and promptly filling jars loosely with the boiled food. Whether food has been hot-packed or raw-packed, the juice, syrup, or water to be added to the foods should also be heated to boiling before adding it to the jars. This practice helps to remove air from food tissues, shrinks food, helps keep the food from floating in the jars, increases vacuum in sealed jars, and improves shelf life. Preshrinking food permits filling more food into each jar.

Hot-packing is the best way to remove air and is the preferred pack style for foods processed in a boiling-water canner. At first, the color of hot-packed foods may appear no better than that of raw-packed foods, but within a short storage period, both color and flavor of hot-packed foods will be superior.

Controlling Headspace

The unfilled space above the food in a jar and below its lid is termed headspace. Directions for canning specify leaving 1/4-inch for jams and jellies, 1/2-inch for fruits and tomatoes to be processed in boiling water, and from 1- to 1-1/4-inches in low acid foods to be processed in a pressure canner. This space is needed for expansion of food as jars are processed, and for forming vacuums in cooled jars. The extent of expansion is determined by the air content in the food and by the processing temperature. Air expands greatly when heated to high temperatures; the higher the temperature, the greater the expansion. Foods expand less than air when heated.

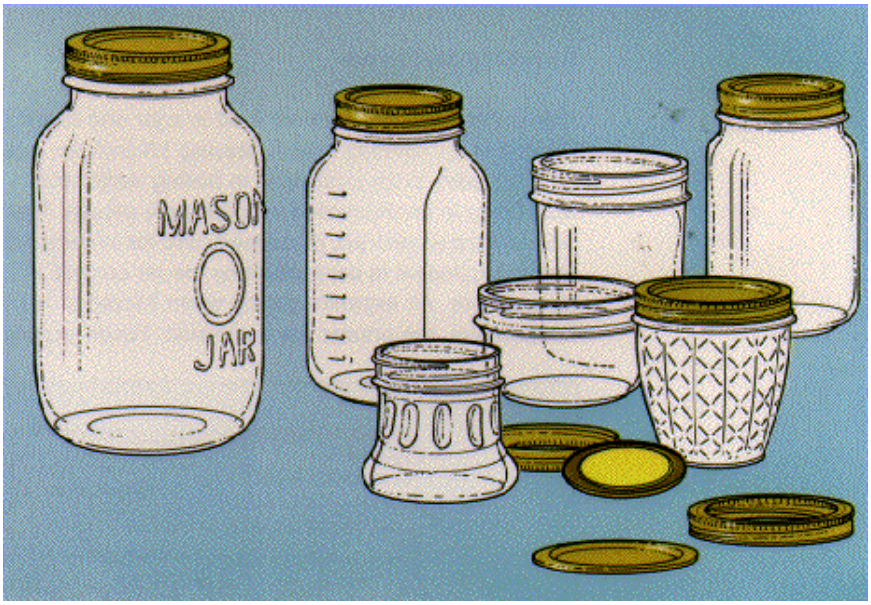


Jars and Lids

Food may be canned in glass jars or metal containers. Metal containers can be used only once. They require special sealing equipment and are much more costly than jars.

Regular and wide-mouth Mason-type, threaded, home-canning jars with self-sealing lids are the best choice. They are available in 1/2 pint, pint, 1-1/2 pint, quart, and 1/2 gallon sizes. The standard jar mouth opening is about 2-3/8 inches. Wide-mouth jars have openings of about 3 inches, making them more easily filled and emptied. Half-gallon jars may be used for canning very acid juices. Regular-mouth decorator jelly jars are available in 8 and 12 ounce sizes. With careful use and handling, Mason jars may be reused many times, requiring only new lids each time. When jars and lids are used properly, jar seals and vacuums are excellent and jar breakage is rare.

Most commercial pint- and quart-size mayonnaise or salad dressing jars may be used with new two-piece lids for canning acid foods. However, you should expect more seal failures and jar breakage. These jars have a narrower sealing surface and are tempered less than Mason jars, and may be weakened by repeated contact with metal spoons or knives used in dispensing mayonnaise or salad dressing. Seemingly insignificant scratches in glass may cause cracking and breakage while processing jars in a canner. Mayonnaise-type jars are not recommended for use with foods to be processed in a pressure canner because of excessive jar breakage. Other commercial jars with mouths that cannot be sealed with two-piece canning lids are not recommended for use in canning any food at home.



Jar Cleaning

Before every use, wash empty jars in hot water with detergent and rinse well by hand, or wash in a dishwasher. Unrinsed detergents may cause unnatural flavors and colors. These washing methods do not sterilize jars. Scale or hard-water films on jars are easily removed by soaking jars several hours in a solution containing 1 cup of vinegar (5 percent acidity) per gallon of water.

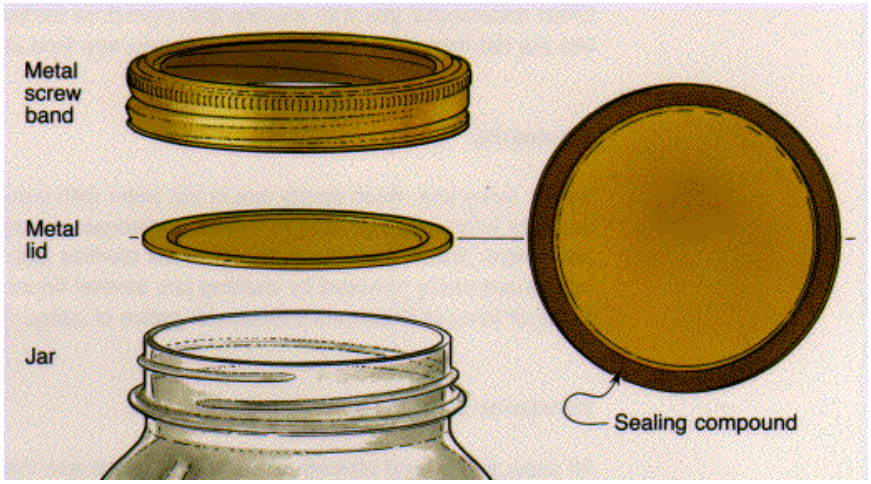
Sterilization of Empty Jars

All jams, jellies, and pickled products processed less than 10 minutes should be filled into sterile empty jars. To sterilize empty jars, put them right side up on the rack in a boiling-water canner. Fill the canner and jars with hot (not boiling) water to 1 inch above the tops of the jars. Boil 10 minutes at altitudes of less than 1,000 ft. At higher elevations, boil 1 additional minute for each additional 1,000 ft elevation. Remove and drain hot sterilized jars one at a time. Save the hot water for processing filled jars. Fill jars with food, add lids, and tighten screw bands.

Empty jars used for vegetables, meats, and fruits to be processed in a pressure canner need not be presterilized. It is also unnecessary to presterilize jars for fruits, tomatoes, and pickled or fermented foods that will be processed 10 minutes or longer in a boiling-water canner.

Lid Selection, Preparation, and Use

The common self-sealing lid consists of a flat metal lid held in place by a metal screw band during processing. The flat lid is crimped around its bottom edge to form a trough, which is filled with a colored gasket compound. When jars are processed, the lid gasket softens and flows



slightly to cover the jar-sealing surface, yet allows air to escape from the jar. The gasket then forms an airtight seal as the jar cools. Gaskets in unused lids work well for at least 5 years from date of manufacture. The gasket compound in older unused lids may fail to seal on jars.

Buy only the quantity of lids you will use in a year. To ensure a good seal, carefully follow the manufacturer's directions in preparing lids for use. Examine all metal lids carefully. Do not use old, dented, or deformed lids, or lids with gaps or other defects in the sealing gasket.

After filling jars with food, release air bubbles by inserting a flat plastic (not metal) spatula between the food and the jar. Slowly turn the jar and move the spatula up and down to allow air bubbles to escape. Adjust the headspace and then clean the jar rim (sealing surface) with a dampened paper towel. Place the lid, gasket down, onto the cleaned jar-sealing surface. Uncleaned jar-sealing surfaces may cause seal failures.

Then fit the metal screw band over the flat lid. Follow the manufacturer's guidelines enclosed with or on the box for tightening the jar lids properly.

Do not retighten lids after processing jars. As jars cool, the contents in the jar contract, pulling the self-sealing lid firmly against the jar to form a high vacuum.

- If rings are too loose, liquid may escape from jars during processing, and seals may fail.
- If rings are too tight, air cannot vent during processing, and food will discolor during storage. Over tightening also may cause lids to buckle and jars to break, especially with raw-packed, pressure-processed food.

Screw bands are not needed on stored jars. They can be removed easily after jars are cooled. When removed, washed, dried, and stored in a dry area, screw bands may be used many times. If left on stored jars, they become difficult to remove, often rust, and may not work properly again.

1. Add salt, if desired.
2. Remove air bubbles with plastic utensil.
3. Wipe upper rim of jar completely for a good seal.
4. Assemble lid.
5. Remove screwband for reuse after processing and jar has cooled.
Metal screwband
Sealing compound under metal lid

Recommended Canners

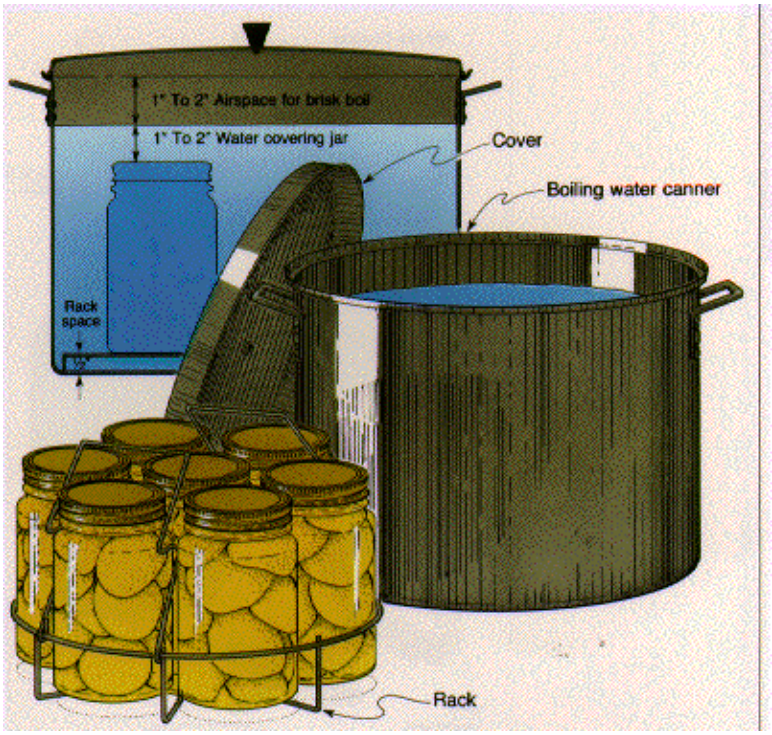
Equipment for heat-processing home-canned food is of two main types—boiling water canners and pressure canners. Most are designed to hold seven quart jars or eight to nine pints. Small pressure canners hold four quart jars; some large pressure canners hold 18 pint jars in two layers, but hold only seven quart jars. Pressure saucepans with smaller volume capacities are not recommended for use in canning. Small capacity pressure canners are treated in a similar manner as standard larger canners, and should be vented using the typical venting procedures.

Low-acid foods must be processed in a pressure canner to be free of botulism risks. Although pressure canners may also be used for processing acid foods, boiling water canners are recommended for this purpose because they are faster. A pressure canner would require from 55 to 100 minutes to process a load of jars; while the total time for processing most acid foods in boiling water varies from 25 to 60 minutes. A boiling-water canner loaded with filled jars requires about 20 to 30 minutes of heating before its water begins to boil. A loaded pressure canner requires about 12 to 15 minutes of heating before it begins to vent; another 10 minutes

to vent the canner; another 5 minutes to pressurize the canner; another 8 to 10 minutes to process the acid food; and, finally, another 20 to 60 minutes to cool the canner before removing jars.

Boiling-water Canners

These canners are made of aluminum or porcelain-covered steel. They have removable perforated racks and fitted lids. The canner must be deep enough so that at least 1 inch of briskly boiling water will be over the tops of jars during processing. Some boiling-water canners do not have flat bottoms. A flat bottom must be used on an electric range. Either a flat or ridged bottom can be used on a gas burner. To ensure uniform processing of all jars with an electric range, the canner should be no more than 4 inches wider in diameter than the element on which it is heated.



Using Boiling-water Canners

Follow these steps for successful boiling-water canning:

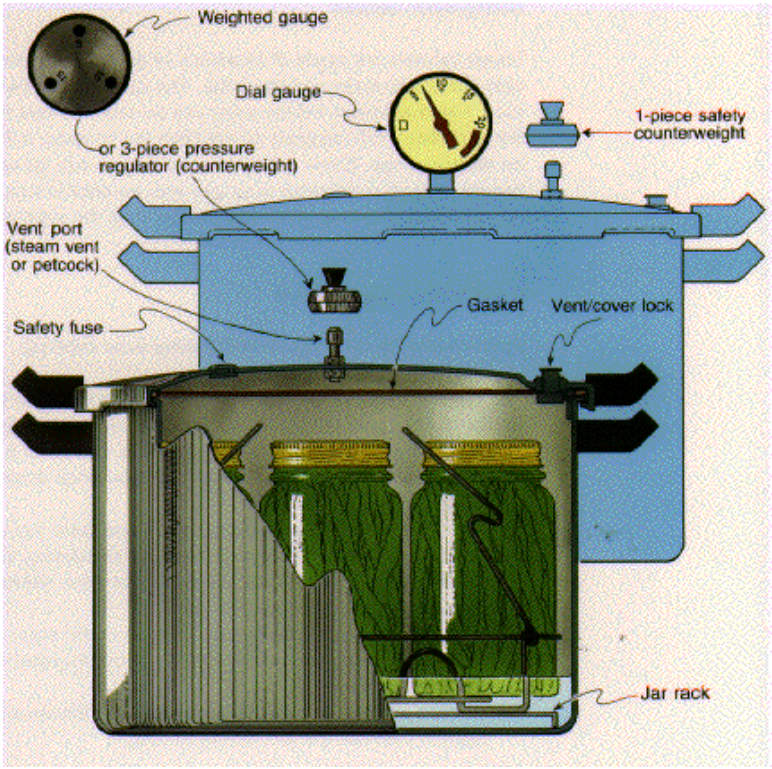
1. Fill the canner halfway with water.
2. Preheat water to 140° F for raw-packed foods and to 180° F for hot-packed foods.
3. Load filled jars, fitted with lids, into the canner rack and use the handles to lower the rack into the water; or fill the canner, one jar at a time, with a jar lifter.
4. Add more boiling water, if needed, so the water level is at least 1 inch above jar tops.
5. Turn heat to its highest position until water boils vigorously.

6. Set a timer for the minutes required for processing the food.
7. Cover with the canner lid and lower the heat setting to maintain a gentle boil throughout the process schedule.
8. Add more boiling water, if needed, to keep the water level above the jars.
9. When jars have been boiled for the recommended time, turn off the heat and remove the canner lid.
10 Using a jar lifter, remove the jars and place them on a towel, leaving at least 1-inch spaces between the jars during cooling.

Pressure Canners

Pressure canners for use in the home have been extensively redesigned in recent years. Models made before the 1970's were heavy-walled kettles with clamp-on or turn-on lids. They were fitted with a dial gauge, a vent port in the form of a petcock or counterweight, and a safety fuse. Modern pressure canners are lightweight, thinwalled kettles; most have turn-on lids. They have a jar rack, gasket, dial or weighted gauge, an automatic vent/cover lock, a vent port (steam vent) to be closed with a counterweight or weighted gauge, and a safety fuse.

Pressure does not destroy microorganisms, but high temperatures applied for an adequate period of time do kill microorganisms. The success of destroying all microorganisms capable of growing in canned food is based on the temperature obtained in pure steam, free of air, at sea level. At sea level, a canner operated at a gauge pressure of 10.5 lbs provides an internal temperature of 240° F.



Two serious errors in temperatures obtained in pressure canners occur because:

1. **Internal canner temperatures are lower at higher altitudes.** To correct this error, canners must be operated at the increased pressures specified in this publication for appropriate altitude ranges.

2. **Air trapped in a canner lowers the temperature obtained at 5, 10, or 15 pounds of pressure and results in under processing.** The highest volume of air trapped in a canner occurs in processing raw-packed foods in dial-gauge canners. These canners do not vent air during processing. To be safe, all types of pressure canners must be vented 10 minutes before they are pressurized.

To vent a canner, leave the vent port uncovered on newer models or manually open petcocks on some older models. Heating the filled canner with its lid locked into place boils water and generates steam that escapes through the petcock or vent port. When steam first escapes, set a timer for 10 minutes. After venting 10 minutes, close the petcock or place the counterweight or weighted gauge over the vent port to pressurize the canner.

Weighted-gauge models exhaust tiny amounts of air and steam each time their gauge rocks or jiggles during processing. They control pressure precisely and need neither watching during processing nor checking for accuracy. The sound of the weight rocking or jiggling indicates that the canner is maintaining the recommended pressure. The single disadvantage of weighted-gauge canners is that they cannot correct precisely for higher altitudes. At altitudes above 1,000 feet, they must be operated at canner pressures of 10 instead of 5, or 15 instead of 10, PSI.

Check dial gauges for accuracy before use each year and replace if they read high by more than 1 pound at 5, 10, or 15 pounds of pressure. Low readings cause over-processing and may indicate that the accuracy of the gauge is unpredictable. Gauges may be checked at most county Cooperative Extension offices.

Handle canner lid gaskets carefully and clean them according to the manufacturer's directions. Nicked or dried gaskets will allow steam leaks during pressurization of canners. Keep gaskets clean between uses. Gaskets on older model canners may require a light coat of vegetable oil once per year. Gaskets on newer model canners are prelubricated and do not benefit from oiling. Check your canner's instructions if there is doubt that the particular gasket you use has been pre-lubricated.

Lid safety fuses are thin metal inserts or rubber plugs designed to relieve excessive pressure from the canner. Do not pick at or scratch fuses while cleaning lids. Use only canners that have the Underwriter's Laboratory (UL) approval to ensure their safety.

Replacement gauges and other parts for canners are often available at stores offering canning equipment or from canner manufacturers. When ordering parts, give your canner model number and describe the parts needed.

Using Pressure Canners

Follow these steps for successful pressure canning:

1. Put 2 to 3 inches of hot water in the canner. Place filled jars on the rack, using a jar lifter. Fasten canner lid securely.
2. Leave weight off vent port or open petcock. Heat at the highest setting until steam flows from the petcock or vent port.
3. Maintain high heat setting, exhaust steam 10 minutes, and then place weight on vent port or close petcock. The canner will pressurize during the next 3 to 5 minutes.
4. Start timing the process when the pressure reading on the dial gauge indicates that the recommended pressure has been reached, or when the weighted gauge begins to jiggle or rock.
5. Regulate heat under the canner to maintain a steady pressure at or slightly above the correct gauge pressure. Quick and large pressure variations during processing may cause unnecessary liquid losses from jars. Weighted gauges on Mirro canners should jiggle about 2 or 3 times per minute. On Presto canners, they should rock slowly throughout the process.

Place 2"-3" of hot water in canner and place jars in canner on canner rack.
1.
Temperature
Exhaust all air from the cooker with vent port open.
2.
To pressurize the canner, place weight on vent port.
3.
Begin timing when weight starts to rock or jiggle, or when pressure gauge reads the correct pressure.
Time
4.
Temperature
Regulate heat for a steady rocking or jiggling motion or proper dial gauge pressure.
5.
Remove from heat.
6.
After cooling, open vent port. Wait 2 minutes; then open cooker. Tilting lid away from you.
7.
Place jars on rack or towel and allow to cool slowly.
8.

6. When the timed process is completed, turn off the heat, remove the canner from heat if possible, and let the canner depressurize. **Do not force-cool the canner.** Forced cooling may result in food spoilage. Cooling the canner with cold running water or opening the vent port before the canner is fully depressurized will cause loss of liquid from jars and seal failures. Force-cooling may also warp the canner lid of older model canners, causing steam leaks. Depressurization of older models should be timed. Standard-size heavy-walled canners require about 30 minutes when loaded with pints and 45 minutes with quarts. Newer thin-walled canners cool more rapidly and are equipped with vent locks. These canners are depressurized when their vent lock piston drops to a normal position.
7. After the canner is depressurized, remove the weight from the vent port or open the petcock. Wait 2 minutes, unfasten the lid, and remove it carefully. Lift the lid away from you so that the steam does not burn your face.
8. Remove jars with a lifter, and place on towel or cooling rack, if desired.

Selecting the Correct Processing Time

When canning in boiling water, more processing time is needed for most raw-packed foods and for quart jars than is needed for hot-packed foods and pint jars.

To destroy microorganisms in acid foods processed in a boiling-water canner, you must:

- Process jars for the correct number of minutes in boiling water.
- Cool the jars at room temperature.

The food may spoil if you fail to add process time for lower boiling-water temperatures at altitudes above 1,000 feet, process for fewer minutes than specified, or cool jars in cold water.

To destroy microorganisms in low-acid foods processed with a pressure canner, you must:

- Process the jars using the correct time and pressure specified for your altitude.
- Allow canner to cool at room temperature until it is completely depressurized.

The food may spoil if you fail to select the proper process times for specific altitudes, fail to exhaust canners properly, process at lower pressure than specified, process for fewer minutes than specified, or cool the canner with water.

Examples of Using Tables for Determining Proper Process Times

This set of guides includes processing times with altitude adjustments for each product. Process times for 1/2-pint and pint jars are the same, as are times for 1-1/2 pint and quart jars. For some products, you have a choice of processing at 5, 10, or 15 PSI. In these cases, choose the canner pressure you wish to use and match it with your pack style (raw or hot) and jar size to find the correct process time. The following examples show how to select the proper process for each type of canner. Process times are given in separate tables for sterilizing jars in boiling-water, dial-gauge, and weighted-gauge canners.

Example A: Boiling-water Canner

Suppose you are canning peaches as a hot-pack in quarts at 2,500 ft above sea level, using a *boiling-water canner.* First, select the process table for boiling-water canner. The example for peaches is given in **Table for Example A** on next page. From that table, select the process time given for (1) the style of pack (hot), (2) the jar size (quarts), and (3) the altitude where you live (2,500 ft). You should have selected a process time of 30 minutes.

Example B: Dial-gauge Pressure Canner

Suppose you are canning peaches as a hot-pack in quarts at 2,500 ft above sea level, using a *dial-gauge pressure canner.* First, select the process table for dial-gauge pressure canner. The example for peaches is given in **Table for Example B** on next page. From that table, select the process pressure (PSI) given for (1) the style of pack (hot), (2) the jar size (quarts), (3) the process time (10 minutes), (4) the altitude where you live (2,500 ft). You should have selected a pressure of 7 lbs for the 10 minutes process time.

Example C: Weighted-gauge Pressure Canner

Suppose you are canning peaches as a hot-pack in quarts at 2,500 ft above sea level, using a *weighted-gauge pressure canner.* First, select the process time for weighted-gauge pressure canner. The example for peaches is given in **Table for Example C** on next page. From that table, select the process pressure (PSI) given for (1) the style of pack (hot), (2) the jar size (quarts), (3) the process time (10 minutes), and (4) the altitude where you live (2,500 ft). You should have selected a pressure of 10 lbs for the 10 minutes process time.

Table for Example A
Recommended process time for Peaches in a BOILING-WATER canner

		Process Time at Altitudes of			
Style of Pack	Jar Size	0–1,000 ft	1,001–3,000 ft	3,001–6,000 ft	Above 6,000 ft
Hot	Pints	20 min	25 min	30 min	35 min
	Quarts	25 min	30 min	35 min	40 min
Raw	Pints	25 min	30 min	35 min	40 min
	Quarts	30 min	35 min	40 min	45 min

Table for Example B
Recommended process time for Peaches in a DIAL-GAUGE pressure canner

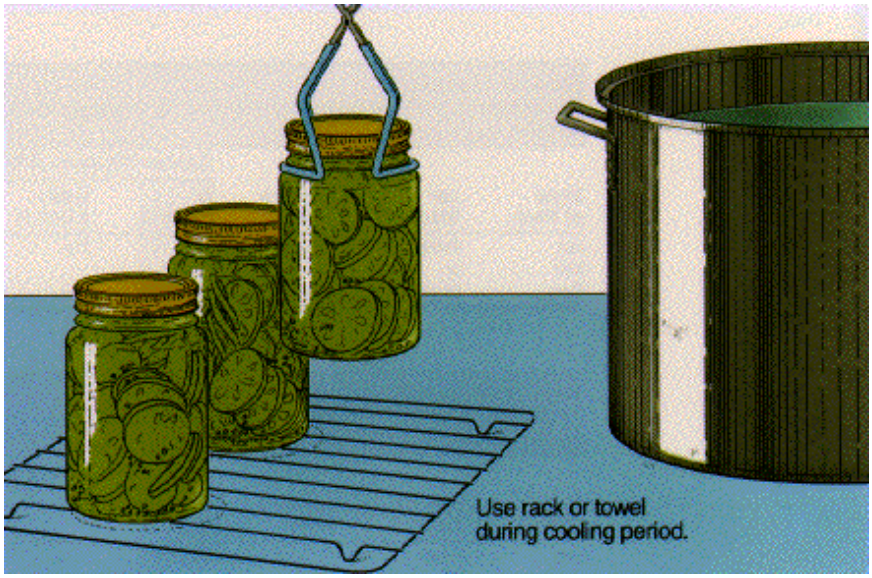
			Canner Gauge Pressure (PSI) at Altitudes of			
Style of Pack	Jar Size	Process Time	0–2,000 ft	2,001–4,000 ft	4,001–6,000 ft	6,001–8,000 ft
Hot and Raw	Pints or Quarts	10 min	6 lb	7 lb	8 lb	9 lb

Table for Example C
Recommended process time for Peaches in a WEIGHTED-GAUGE pressure canner

			Canner Gauge Pressure (PSI) at Altitudes of	
Style of Pack	Jar Size	Process Time	0–1,000 ft	Above 1,000 ft
Hot and Raw	Pints or Quarts	10 min	5 lb	10 lb

Cooling Jars

When you remove hot jars from a canner, do not retighten their jar lids. Retightening of hot lids may cut through the gasket and cause seal failures. Cool the jars at room temperature for 12 to 24 hours. Jars may be cooled on racks or towels to minimize heat damage to counters. The



food level and liquid volume of raw-packed jars will be noticeably lower after cooling. Air is exhausted during processing and food shrinks. If a jar loses excessive liquid during processing, do not open it to add more liquid. Check for sealed lids as described below.

Testing Jar Seals

After cooling jars for 12 to 24 hours, remove the screw bands and test seals with one of the following options:

Option 1. Press the middle of the lid with a finger or thumb. If the lid springs up when you release your finger, the lid is unsealed.
Option 2. Tap the lid with the bottom of a teaspoon. If it makes a dull sound, the lid is not sealed. If food is in contact with the underside of the lid, it will also cause a dull sound. If the jar is sealed correctly, it will make a ringing, high-pitched sound.
Option 3. Hold the jar at eye level and look across the lid. The lid should be concave (curved down slightly in the center). If center of the lid is either flat or bulging, it may not be

Press the center of lid with finger or thumb
Listen for high-pitched ring when lid is tapped with spoon
Note general "concaveness" to lid

sealed.

Reprocessing Unsealed Jars

If a lid fails to seal on a jar, remove the lid and check the jar-sealing surface for tiny nicks. If necessary, change the jar, add a new, properly prepared lid, and reprocess within 24 hours using the same processing time. Headspace in unsealed jars may be adjusted to 1-1/2 inches and jars could be frozen instead of reprocessed. Foods in single unsealed jars could be stored in the refrigerator and consumed within several days.

Storing Canned Foods

If lids are tightly vacuum sealed on cooled jars, remove screw bands, wash the lid and jar to remove food residue; then rinse and dry jars. Label and date the jars and store them in a clean,

cool, dark, dry place. Do not store jars above 95° F or near hot pipes, a range, a furnace, in an uninsulated attic, or in direct sunlight. Under these conditions, food will lose quality in a few weeks or months and may spoil. Dampness may corrode metal lids, break seals, and allow recontamination and spoilage.

Accidental freezing of canned foods will not cause spoilage unless jars become unsealed and recontaminated. However, freezing and thawing may soften food. If jars must be stored where they may freeze, wrap them in newspapers, place them in heavy cartons, and cover with more newspapers and blankets.

Identifying and Handling Spoiled Canned Food

Do not taste food from a jar with an unsealed lid or food that shows signs of spoilage. You can more easily detect some types of spoilage in jars stored without screw bands. Growth of spoilage bacteria and yeast produces gas which pressurizes the food, swells lids, and breaks jar seals. As each stored jar is selected for use, examine its lid for tightness and vacuum. Lids with concave centers have good seals.

Next, while holding the jar upright at eye level, rotate the jar and examine its outside surface for streaks of dried food originating at the top of the jar. Look at the contents for rising air bubbles and unnatural color.

While opening the jar, smell for unnatural odors and look for spurting liquid and cottonlike mold growth (white, blue, black, or green) on the top food surface and underside of lid.

Spoiled low-acid foods, including tomatoes, may exhibit different kinds of spoilage evidence or very little evidence. Therefore, all suspect containers of spoiled low-acid foods, including tomatoes, should be treated as having produced botulinum toxin and handled carefully in one of two ways:

- If the swollen metal cans or suspect glass jars are still sealed, place them in a heavy garbage bag. Close and place the bag in a regular trash container or bury it in a nearby landfill.
- If the suspect cans or glass jars are unsealed, open, or leaking, they should be detoxified before disposal.

Detoxification process: Carefully place the suspect containers and lids on their sides in an 8-quart volume or larger stock pot, pan, or boiling-water canner. Wash your hands thoroughly. Carefully add water to the pot. The water should completely cover the containers with a minimum of a 1-inch level above the containers. Avoid splashing the water. Place a lid on the pot and heat the water to boiling. Boil 30 minutes to ensure detoxifying the food and all container components. Cool and discard the containers, their lids, and food in the trash or bury in soil.

Thoroughly scrub all counters, containers, and equipment including can opener, clothing, and hands that may have contacted the food or containers. Discard any sponges or wash cloths that may have been used in the cleanup. Place them in a plastic bag and discard in the trash.

Preparing Pickled and Fermented Foods

The many varieties of pickled and fermented foods are classified by ingredients and method of preparation.

Regular dill pickles and sauerkraut are fermented and cured for about 3 weeks. Refrigerator dills are fermented for about 1 week. During curing, colors and flavors change and acidity increases. Fresh-pack or quick-process pickles are not fermented; some are brined several hours or overnight, then drained and covered with vinegar and seasonings. Fruit pickles usually are prepared by heating fruit in a seasoned syrup acidified with either lemon juice or vinegar. Relishes are made from chopped fruits and vegetables that are cooked with seasonings and vinegar.

Be sure to remove and discard a 1/16-inch slice from the blossom end of fresh cucumbers. Blossoms may contain an enzyme which causes excessive softening of pickles.

Caution: The level of acidity in a pickled product is as important to its safety as it is to taste and texture.

- **Do not alter vinegar, food, or water proportions in a recipe or use a vinegar with unknown acidity.**
- **Use only recipes with tested proportions of ingredients.**
- **There must be a minimum, uniform level of acid throughout the mixed product to prevent the growth of botulinum bacteria.**

Ingredients

Select fresh, firm fruits or vegetables free of spoilage. Measure or weigh amounts carefully, because the proportion of fresh food to other ingredients will affect flavor and, in many instances, safety.

Use canning or pickling salt. Noncaking material added to other salts may make the brine cloudy. Since flake salt varies in density, it is not recommended for making pickled and fermented foods. White granulated and brown sugars are most often used. Corn syrup and honey, unless called for in reliable recipes, may produce undesirable flavors. White distilled and cider vinegars of 5 percent acidity (50 grain) are recommended. White vinegar is usually preferred when light color is desirable, as is the case with fruits and cauliflower.

Pickles with Reduced Salt Content

Recipes for pickles with reduced sodium content are provided in Guide 6.

In the making of fresh-pack pickles, cucumbers are acidified quickly with vinegar. Use only

tested recipes formulated to produce the proper acidity. While these pickles may be prepared safely with reduced or no salt, their quality may be noticeably lower. Both texture and flavor may be slightly, but noticeably, different than expected. You may wish to make small quantities first to determine if you like them.

However, the salt used in making fermented sauerkraut and brined pickles not only provides characteristic flavor but also is vital to safety and texture. In fermented foods, salt favors the growth of desirable bacteria while inhibiting the growth of others. **Caution: Do not attempt to make sauerkraut or fermented pickles by cutting back on the salt required.**

Firming Agents

Alum may be safely used to firm fermented pickles. However, it is unnecessary and is not included in the recipes in this publication. Alum does not improve the firmness of quick-process pickles. The calcium in lime definitely improves pickle firmness. Food-grade lime may be used as a lime-water solution for soaking fresh cucumbers 12 to 24 hours before pickling them. Excess lime absorbed by the cucumbers must be removed to make safe pickles. To remove excess lime, drain the lime-water solution, rinse, and then resoak the cucumbers in fresh water for 1 hour. Repeat the rinsing and soaking steps two more times. To further improve pickle firmness, you may process cucumber pickles for 30 minutes in water at 180° F. This process also prevents spoilage, **but the water temperature should not fall below 180° F.** Use a candy or jelly thermometer to check the water temperature.

Preventing Spoilage

Pickle products are subject to spoilage from microorganisms, particularly yeasts and molds, as well as enzymes that may affect flavor, color, and texture. Processing the pickles in a boiling-water canner will prevent both of these problems. Standard canning jars and self-sealing lids are recommended. Processing times and procedures will vary according to food acidity and the size of food pieces.

Preparing Butters, Jams, Jellies, and Marmalades

Sweet spreads are a class of foods with many textures, flavors, and colors. They all consist of fruits preserved mostly by means of sugar and they are thickened or jellied to some extent. Fruit jelly is a semi-solid mixture of fruit juice and sugar that is clear and firm enough to hold its shape. Other spreads are made from crushed or ground fruit.

Jam also will hold its shape, but it is less firm than jelly. Jam is made from crushed or chopped fruits and sugar. Jams made from a mixture of fruits are usually called conserves, especially when they include citrus fruits, nuts, raisins, or coconut. Preserves are made of small, whole fruits or uniform-size pieces of fruits in a clear, thick, slightly jellied syrup. Marmalades are soft fruit jellies with small pieces of fruit or citrus peel evenly suspended in a transparent jelly. Fruit butters are made from fruit pulp cooked with sugar until thickened to a spreadable consistency.

Ingredients

For proper texture, jellied fruit products require the correct combination of fruit, pectin, acid, and sugar. The fruit gives each spread its unique flavor and color. It also supplies the water to dissolve the rest of the necessary ingredients and furnishes some or all of the pectin and acid. Good-quality, flavorful fruits make the best jellied products.

Pectins are substances in fruits that form a gel if they are in the right combination with acid and sugar. All fruits contain some pectin. Apples, crab apples, gooseberries, and some plums and grapes usually contain enough natural pectin to form a gel. Other fruits, such as strawberries, cherries, and blueberries, contain little pectin and must be combined with other fruits high in pectin or with commercial pectin products to obtain gels. Because fully ripened fruit has less pectin, one-fourth of the fruit used in making jellies without added pectin should be underripe.

Caution: Commercially frozen and canned juices may be low in natural pectins and make soft textured spreads.

The proper level of acidity is critical to gel formation. If there is too little acid, the gel will never set; if there is too much acid, the gel will lose liquid (weep). For fruits low in acid, add lemon juice or other acid ingredients as directed. Commercial pectin products contain acids which help to ensure gelling.

Sugar serves as a preserving agent, contributes flavor, and aids in gelling. Cane and beet sugar are the usual sources of sugar for jelly or jam. Corn syrup and honey may be used to replace part of the sugar in recipes, but too much will mask the fruit flavor and alter the gel structure. Use tested recipes for replacing sugar with honey and corn syrup. Do not try to reduce the amount of sugar in traditional recipes. Too little sugar prevents gelling and may allow yeasts and molds to grow.

Jams and Jellies with Reduced Sugar

Jellies and jams that contain modified pectin, gelatin, or gums may be made with noncaloric sweeteners. Jams with less sugar than usual also may be made with concentrated fruit pulp, which contains less liquid and less sugar. See Guide 7 for recipes.

Two types of modified pectin are available for home use. One gels with one-third less sugar. The other is a low-methoxyl pectin which requires a source of calcium for gelling. To prevent spoilage, jars of these products must be processed longer in a boiling-water canner. Recipes and processing times provided with each modified pectin product must be followed carefully. The proportions of acids and fruits should not be altered, as spoilage may result.

Acceptably gelled refrigerator fruit spreads also may be made with gelatin and sugar substitutes. Such products spoil at room temperature, must be refrigerated, and should be eaten within 1 month.

Preventing Spoilage

Even though sugar helps preserve jellies and jams, molds can grow on the surface of these products. Research now indicates that the mold which people usually scrape off the surface of jellies may not be as harmless as it seems. Mycotoxins have been found in some jars of jelly having surface mold growth. Mycotoxins are known to cause cancer in animals; their effects on humans are still being researched.

Because of possible mold contamination, paraffin or wax seals are no longer recommended for any sweet spread, including jellies. To prevent growth of molds and loss of good flavor or color, fill products hot into sterile Mason jars, leaving 1/4-inch headspace, seal with self-sealing lids, and process 5 minutes in a boiling-water canner. Correct process time at higher elevations by adding 1 additional minute per 1,000 ft above sea level. If unsterile jars are used, the filled jars should be processed 10 minutes. Use of sterile jars is preferred, especially when fruits are low in pectin, since the added 5-minute process time may cause weak gels. To sterilize empty jars, see page 1-9.

Methods of Making Jams and Jellies

The two basic methods of making jams and jellies are described in Guide 7. The standard method, which does not require added pectin, works best with fruits naturally high in pectin. The other method, which requires the use of commercial liquid or powdered pectin, is much quicker. The gelling ability of various pectins differs. To make uniformly gelled products, be sure to add the quantities of commercial pectins to specific fruits as instructed on each package. Overcooking may break down pectin and prevent proper gelling. When using either method, make one batch at a time, according to the recipe. Increasing the quantities often results in soft gels. Stir constantly while cooking to prevent burning. Recipes are developed for specific jar sizes. If jellies are filled into larger jars, excessively soft products may result.

Canned Foods for Special Diets

The cost of commercially canned special diet food often prompts interest in preparing these products at home. Some low-sugar and low-salt foods may be easily and safely canned at home. However, the color, flavor, and texture of these foods may be different than expected and be less acceptable.

Canning without Sugar

In canning regular fruits without sugar, it is very important to select fully ripe but firm fruits of the best quality. Prepare these as described for hot-packs in Guide 2, but use water or regular unsweetened fruit juices instead of sugar syrup. Juice made from the fruit being canned is best. Blends of unsweetened apple, pineapple, and white grape juice are also good for filling over solid fruit pieces. Adjust headspaces and lids and use the processing recommendations given for regular fruits. Add sugar substitutes, if desired, when serving.

Canning without Salt (Reduced Sodium)

To can tomatoes, vegetables, meats, poultry, and seafood, use the procedures given in Guides 3 through 5, but omit the salt. In these products, salt seasons the food but is not necessary to ensure its safety. Add salt substitutes, if desired, when serving.

Canning Fruit-based Baby Foods

You may prepare any chunk-style or pureed fruit with or without sugar, using the procedure for preparing each fruit as given in Guide 2. Pack in half-pint, preferably, or pint jars and use the following processing times.

Process time for fruit-based baby foods in a BOILING-WATER canner

		Process Times at Altitudes of		
Style of Pack	Jar Size	0–1,000 ft	1,001–6,000 ft	Above 6,000 ft
Hot	Pints	20 min	25	30

Caution: Do not attempt to can pureed vegetables, red meats, or poultry meats, because proper processing times for pureed foods have not been determined for home use. Instead, can and store these foods using the standard processing procedures; puree or blend them at serving time. Heat the blended foods to boiling, simmer for 10 minutes, cool, and serve. Store unused portions in the refrigerator and use within 2 days for best quality.

How Much Should You Can?

The amount of food to preserve for your family, either by canning or freezing, should be based on individual choices. The following table can serve as a worksheet to plan how much food you should can for use within a year.

Suggested Preservation Plan for Canned and Frozen Foods

Kind of Food	Servings/week[a]				My family needs					
	Serving Size	Per Person		My Family[b]	Cups/ week[c]	Qts/ week[d]	Weeks served/yr[a]	Quarts/year		
		Suggest	Actual					Total[e]	Canned[a]	Frozen[a]
Example: Family of 4										
Fruits	1/2 cup	12	12	48	24	6	36	216	72	144
My Plan:										
Fruits - apples, berries, peaches, plums, pears, tomatoes	1/2 cup	12								
Juices - apple, berry grape, tomato	1 cup	7								
Vegetables - beets, beans, carrots, corn peas, pumpkin, squash	1/2 cup	16								
Meat & Seafood - red meat, poultry, shellfish, fish	1/2 cuo	14								
Soups	1 cup	2								
Pickles & Relishes - ketchup, fruit pickles, vegetable pickles, relish, etc.	-	1/2 cup								
Fruit Spreads - honey, jellies, jam, syrups, preserves, etc.	-	1/2 cup								
Sauces - tomato, etc.	1/2 cup	2								

a Your family should make these decisions.

b Servings/week for my family = actual weekly servings/person multiplied by number of family members who eat that food.

c Cups/week = servings/week multiplied by recommended serving size.

d Quarts/week = cups/week divided by 4.

e Total quarts/year = quarts/week multiplied by weeks served/year.

Glossary of Terms

Acid foods Foods which contain enough acid to result in a pH of 4.6 or lower. Includes all fruits except figs; most tomatoes; fermented and pickled vegetables; relishes; and jams, jellies, and marmalades. Acid foods may be processed in boiling water.

Altitude The vertical elevation of a location above sea level.

Ascorbic acid The chemical name for vitamin C. Lemon juice contains large quantities of ascorbic acid and is commonly used to prevent browning of peeled, light-colored fruits and vegetables.

Bacteria A large group of one-celled microorganisms widely distributed in nature. See microorganism.

Blancher A 6- to 8-quart lidded pot designed with a fitted perforated basket to hold food in boiling water, or with a fitted rack to steam foods. Useful for loosening skins on fruits to be peeled, or for heating foods to be hot packed.

Boiling-water canner A large standard-sized lidded kettle with jar rack, designed for heat-processing 7 quarts or 8 to 9 pints in boiling water.

Botulism An illness caused by eating toxin produced by growth *of Clostridium botulinum* bacteria in moist, low-acid food, containing less than 2 percent oxygen, and stored between 40° and 120° F. Proper heat processing destroys this bacterium in canned food. Freezer temperatures inhibit its growth in frozen food. Low moisture controls its growth in dried food. High oxygen controls its growth in fresh foods.

Canning A method of preserving food in air-tight vacuum-sealed containers and heat processing sufficiently to enable storing the food at normal home temperatures.

Canning salt Also called pickling salt. It is regular table salt without the anticaking or iodine additives.

Citric acid A form of acid that can be added to canned foods. It increases the acidity of low-acid foods and may improve the flavor and color.

Cold pack Canning procedure in which jars are filled with raw food. "Raw pack" is the preferred term for describing this practice. "Cold pack" is often used incorrectly to refer to foods that are open-kettle canned or jars that are heat-processed in boiling water.

Enzymes Proteins in food which accelerate many flavor, color, texture, and nutritional changes, especially when food is cut, sliced, crushed, bruised, and exposed to air. Proper blanching or hot-packing practices destroy enzymes and improve food quality.

Exhausting Removal of air from within and around food and from jars and canners. Blanching exhausts air from live food tissues. Exhausting or venting of pressure canners is necessary to prevent a risk of botulism in low-acid canned foods.

Fermentation Changes in food caused by intentional growth of bacteria, yeast, or mold. Native bacteria ferment natural sugars to lactic acid, a major flavoring and preservative in sauerkraut and in naturally fermented dills. Alcohol, vinegar, and some dairy products are also fermented foods.

Headspace The unfilled space above food or liquid in jars. Allows for food expansion as jars are heated, and for forming vacuums as jars cool.

Heat processing Treatment of jars with sufficient heat to enable storing food at normal home temperatures.

Hermetic seal An absolutely airtight container seal which prevents reentry of air or microorganisms into packaged foods.

Hot pack Heating of raw food in boiling water or steam and filling it hot into jars.

Low-acid foods Foods which contain very little acid and have a pH above 4.6. The acidity in these foods is insufficient to prevent the growth of the bacterium *Clostridium botulinum.* Vegetables, some tomatoes, figs, all meats, fish, seafoods, and some dairy foods are low acid. To control all risks of botulism, jars of these foods must be (1) heat processed in a pressure canner, or (2) acidified to a pH of 4.6 or lower before processing in boiling water.

Microorganisms Independent organisms of microscopic size, including bacteria, yeast, and mold. When alive in a suitable environment, they grow rapidly and may divide or reproduce every 10 to 30 minutes. Therefore, they reach high populations very quickly. Undesirable microorganisms cause disease and food spoilage. Microorganisms are sometimes intentionally added to ferment foods, make antibiotics, and for other reasons.

Mold A fungus-type microorganism whose growth on food is usually visible and colorful. Molds may grow on many foods, including acid foods like jams and jellies and canned fruits. Recommended heat processing and sealing practices prevent their growth on these foods.

Mycotoxins Toxins produced by the growth of some molds on foods.

Open-kettle canning
A non-recommended canning method. Food is supposedly adequately heat processed in a covered kettle, and then filled hot and sealed in sterile jars. Foods canned this way have low vacuums or too much air, which permits rapid loss of quality in foods. Moreover, these foods often spoil because they become recontaminated while the jars are being filled.

Pasteurization Heating of a specific food enough to destroy the most heat-resistant pathogenic or disease-causing microorganism known to be associated with that food.

pH A measure of acidity or alkalinity. Values range from 0 to 14. A food is neutral when its pH is 7.0: lower values are increasingly more acid; higher values are increasingly more alkaline.

Pickling The practice of adding enough vinegar or lemon juice to a low-acid food to lower its pH to 4.6 or lower. Properly pickled foods may be safely heat processed in boiling water.

Pressure Canner A specifically designed metal kettle with a lockable lid used for heat processing low-acid food. These canners have jar racks, one or more safety devices, systems for exhausting air, and a way to measure or control pressure.

Canners with 20- to 21- quart capacity are common. The minimum volume of canner that can be used is 16-quart capacity, which will contain 7 quart jars. Use of pressure saucepans with less than 16-quart capacities is not recommended.

Raw pack The practice of filling jars with raw, unheated food. Acceptable for canning low-acid foods, but allows more rapid quality losses in acid foods heat processed in boiling water.

Spice bag A closeable fabric bag used to extract spice flavors in pickling solution.

Style of pack Form of canned food, such as whole, sliced, piece, juice, or sauce. The term may also be used to reveal whether food is filled raw or hot into jars.

Vacuum The state of negative pressure. Reflects how thoroughly air is removed from within a jar of processed food—the higher the vacuum, the less air left in the jar.

Yeasts A group of microorganisms which reproduce by budding. They are used in fermenting some foods and in leavening breads.